Initial NATA National Scale Assessment

Region/ORD Cumulative Risk Assessment Workshop

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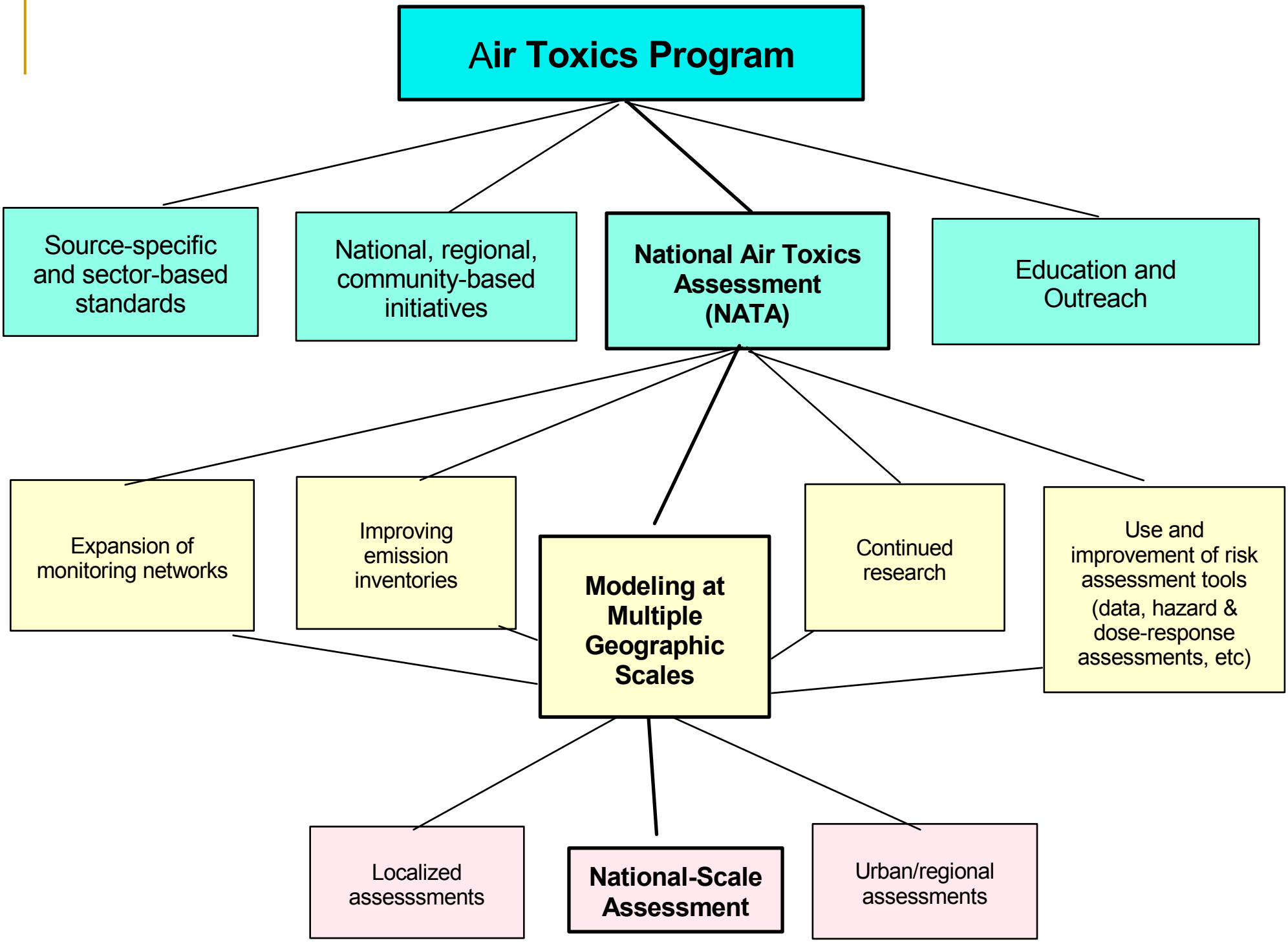
Deirdre Murphy*, Roy Smith, Ted Palma, Madeleine Strum
Office of Air Quality Planning & Standards (OAQPS)

NATA Activities are…

- ...a number of technical support activities designed to provide all parts of EPA's Air Toxics Program with the following quantitative, policy-relevant, and consistent information:
  - Emissions inventories
  - Monitoring network
  - Air quality, exposure, and risk modeling
  - Research on effects and assessment tools

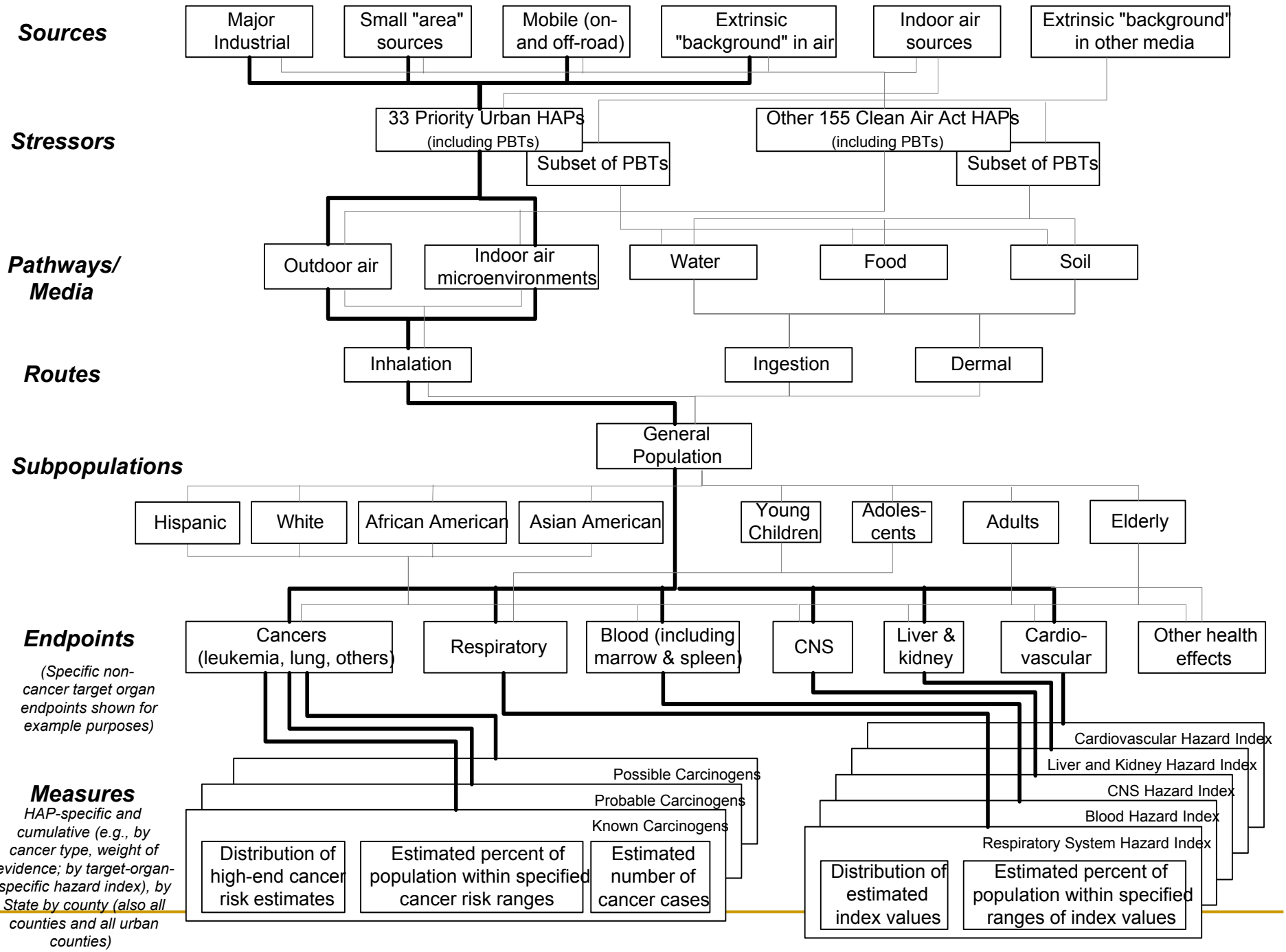

Air Toxics Program
Source-specific and sector-based standards
National, regional, community-based initiatives
National Air Toxics Assessment (NATA)
Education and Outreach
Expansion of monitoring networks
Improving emission inventories
Modeling at Multiple Geographic Scales
Continued research
Use and improvement of risk assessment tools (data, hazard & dose-response assessments, etc)
Localized assesssments
National-Scale Assessment
Urban/regional assessments

Goals of the National-Scale Assessment

- Identify air toxics of greatest concern
- Characterize contributions of different emission sources to exposure and risk
- Prioritize collection of new data
- Provide a baseline (with ambient data) to track trends and measure progress against goals
- Assist in scoping local- and urban-scale assessments
- By itself, the assessment is **NOT** being used as the basis for specific regulatory decisions

Figure 3 -- Initial National-scale Air Toxics Health Assessment: Conceptual M

(**Heavy lines** indicate dimensions/elements in *quantitative* assessment/characterization; light lines included in *qualitative* characterization)



Limitations of the Initial National-Scale Assessment

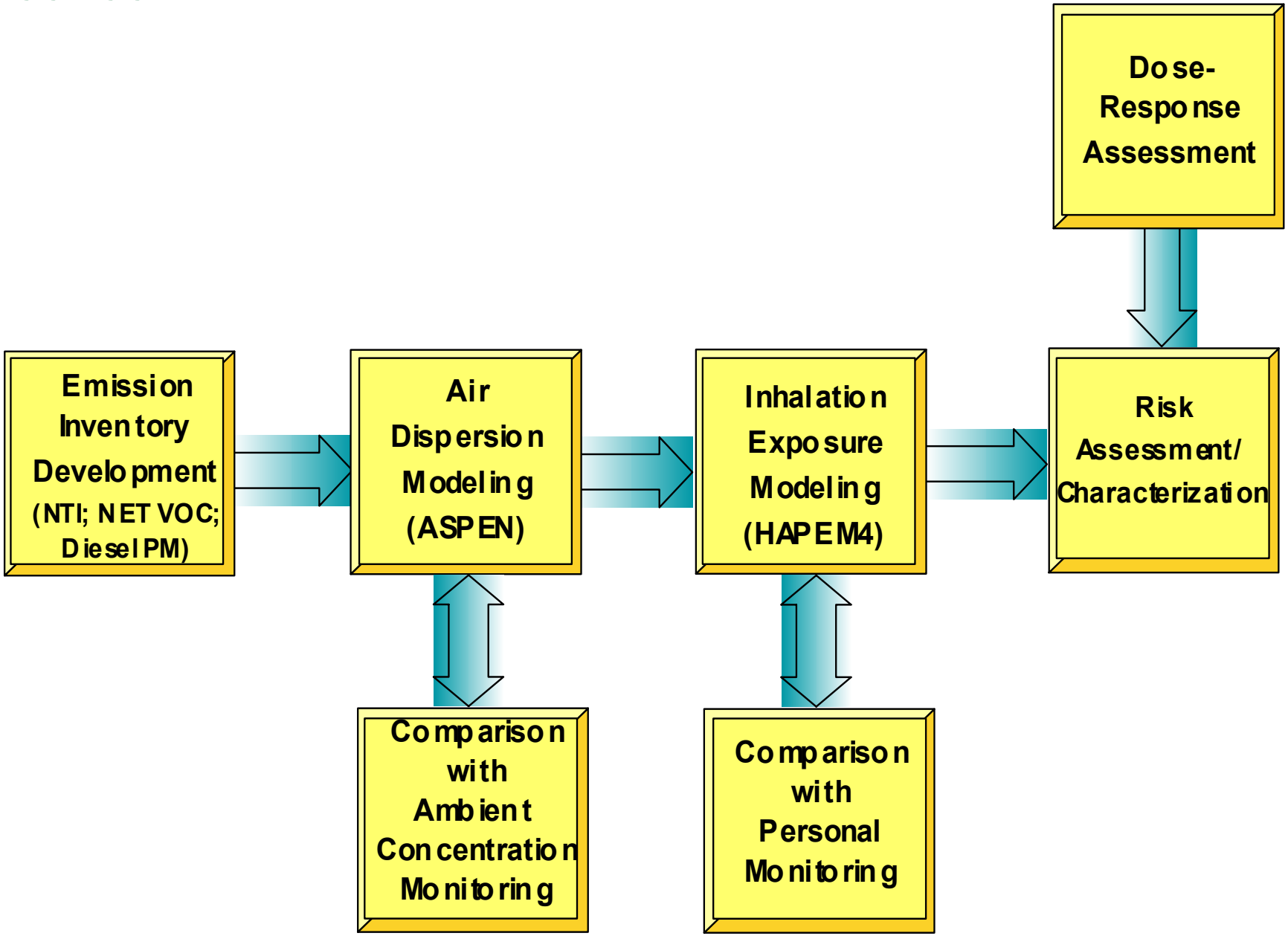
- Inhalation exposure **only**
- Chronic exposures **only**
- 1996 emissions data
- Sources of indoor origin **excluded**
- 50-km range
- Focuses on average/median exposures, not individual extremes
- Census tract-level calculations; county-level and higher presentations
- 32 urban HAPs & diesel PM

Pollutants* included in the Initial National-Scale Assessment

- acetaldehyde
- acrolein
- acrylonitrile
- arsenic compounds
- benzene
- beryllium compounds
- 1,3-butadiene
- cadmium compounds
- carbon tetrachloride
- chloroform
- chromium compounds
- coke oven emissions
- 1,2-dibromoethane (ethylene dibromide)
- 1,2-dichloropropane (propylene dichloride)
- 1,3-dichloropropene
- ethylene dichloride (1,2-dichloroethane)
- ethylene oxide
- formaldehyde
- hexachlorobenzene
- hydrazine
- lead compounds
- manganese compounds
- mercury compounds
- methylene chloride (dichloromethane)
- nickel compounds
- polychlorinated biphenyls (PCBs)
- polycyclic organic matter (POM)
- quinoline
- 1,1,2,2-tetrachloroethane
- tetrachloroethylene (perchloroethylene)
- trichloroethylene
- vinyl chloride
- diesel particulate matter

***List based on the 33 urban HAPs. Dioxin (an urban HAP) not included because of inventory inconsistencies.**

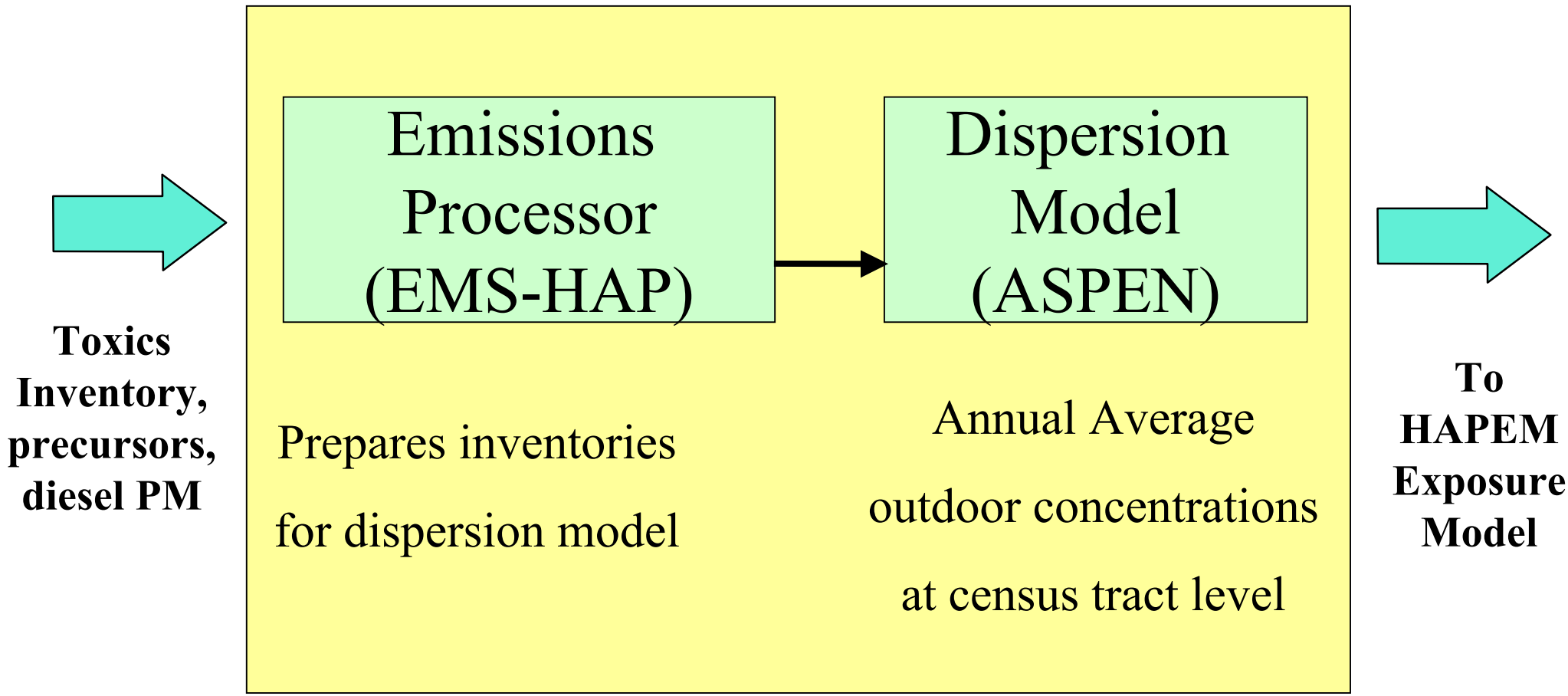
Components of the Initial National-Scale Assessment

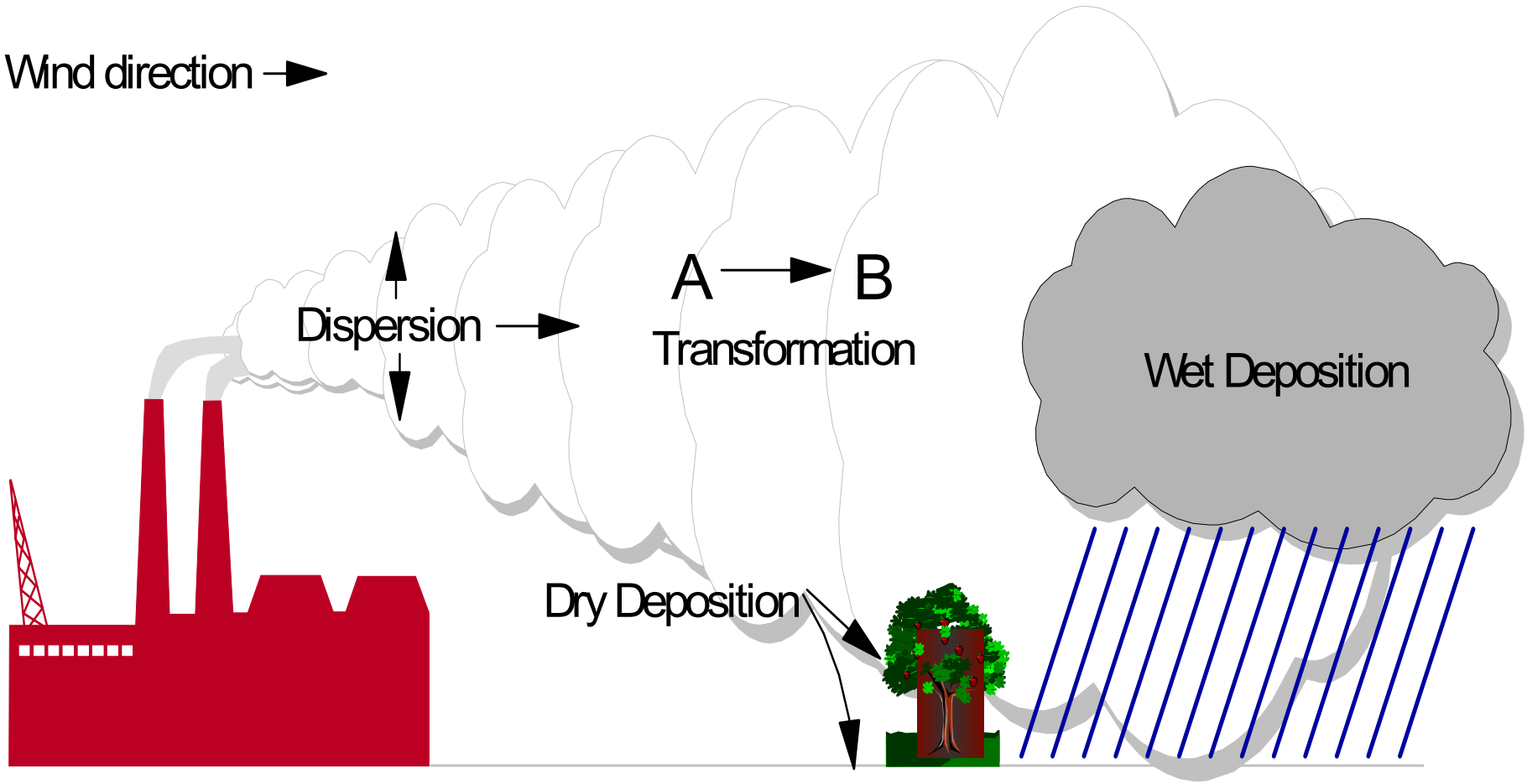


Emissions Inventories

- Entire Assessment only as good as inventory used in modeling
  - 1996 National Toxics Inventory (NTI)
    - 32 Urban HAPs, includes mobile and stationary sources
    - Primary source of data from States/Locals
    - Includes model parameters for many stationary sources
  - 1996 VOC in National Emissions Trends Inventory
    - Used for secondarily formed components of formaldehyde and acetaldehyde
  - Diesel PM - 1996 Heavy Duty Diesel Rule Inventory

Ambient Air Quality Modeling

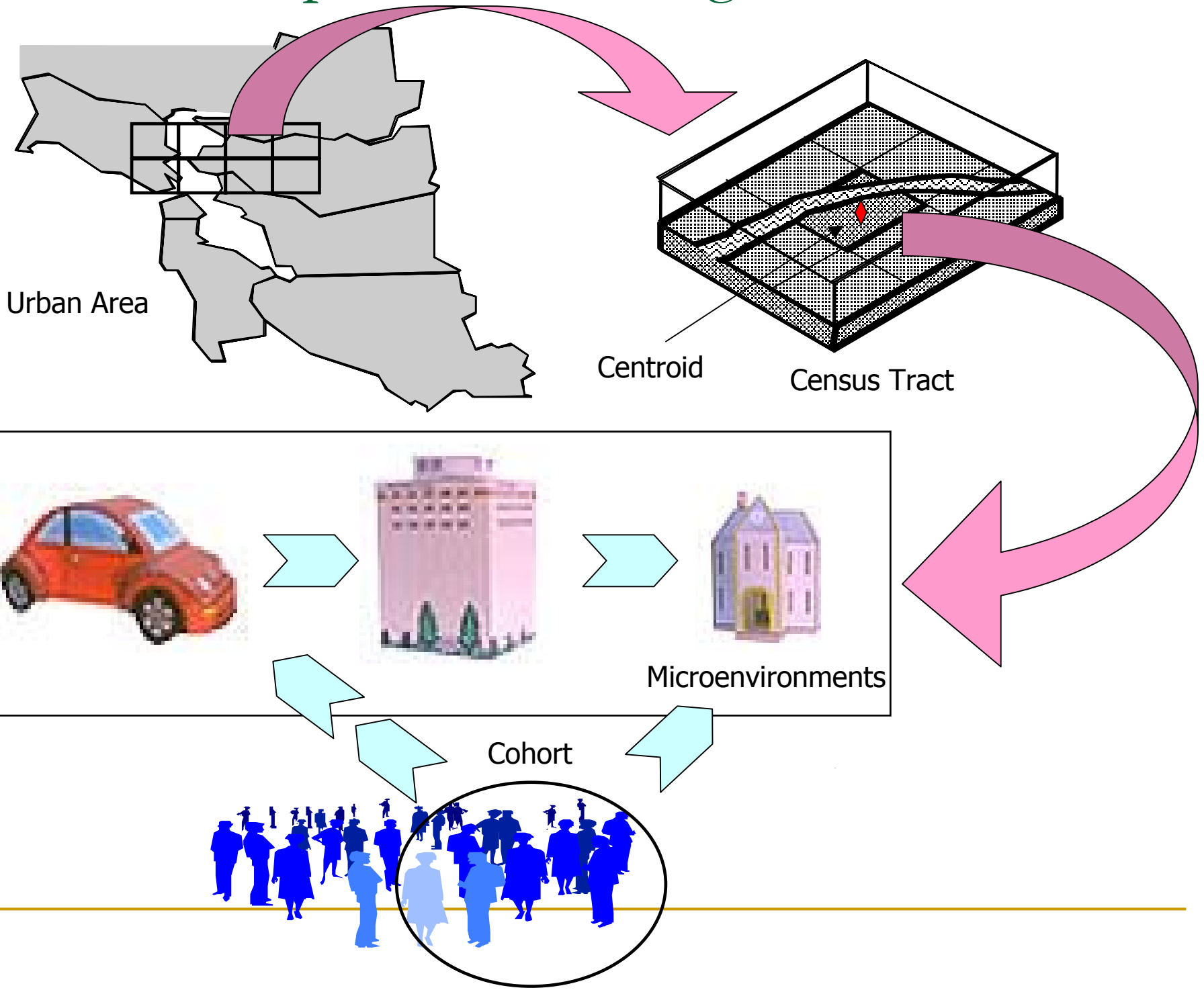



Wind direction
Dispersion
A
B
Transformation
Wet Deposition
Dry Deposition

Inhalation Exposure Modeling HAPEM4 Approach

- Model used to predict breathing zone concentration for simulation period
- Model utilizes activity patterns for each cohort (a representative person) from time activity diary data (CHAD)
- Model tracks cohort movement through time (over a year) and space (through microenvironments (37) located within census tracts) and determines a composite breathing zone concentration for the simulation time period for each cohort.
- From age group cohort estimates, a lifetime (70yr) exposure estimate is derived (i.e., presuming repeating 1996 air quality predictions for all 70 yrs).

Inhalation Exposure Modeling -HAPEM4



Risk Characterization

- Cancer
  - URE = risk per ug/m3, for lifetime
  - Risk = URE for each substance x median lifetime exposure for each tract
  - Result: ca. 61K risk estimates x 29 substances
- Non-cancer
  - RfC = level believed safe
  - HQ = median exposure for each tract / RfC
    - Ratio between "safe" level and exposure
  - Result: ca. 61K HQs x 27 substances

Cumulative Risk/Hazard Characterization

- Cancer Risk estimates for substances with…
  - WOE supported by human evidence (A & B1)
  - WOE supported by animal evidence (B2 & C)
  - All of above (A, B1, B2 & C)

- Non-cancer Hazard Index for
  - Substances with similarity in toxicological effect
    - Respiratory Irritation HI – sum of 8 HQs

Uncertainty - Confidence in Results

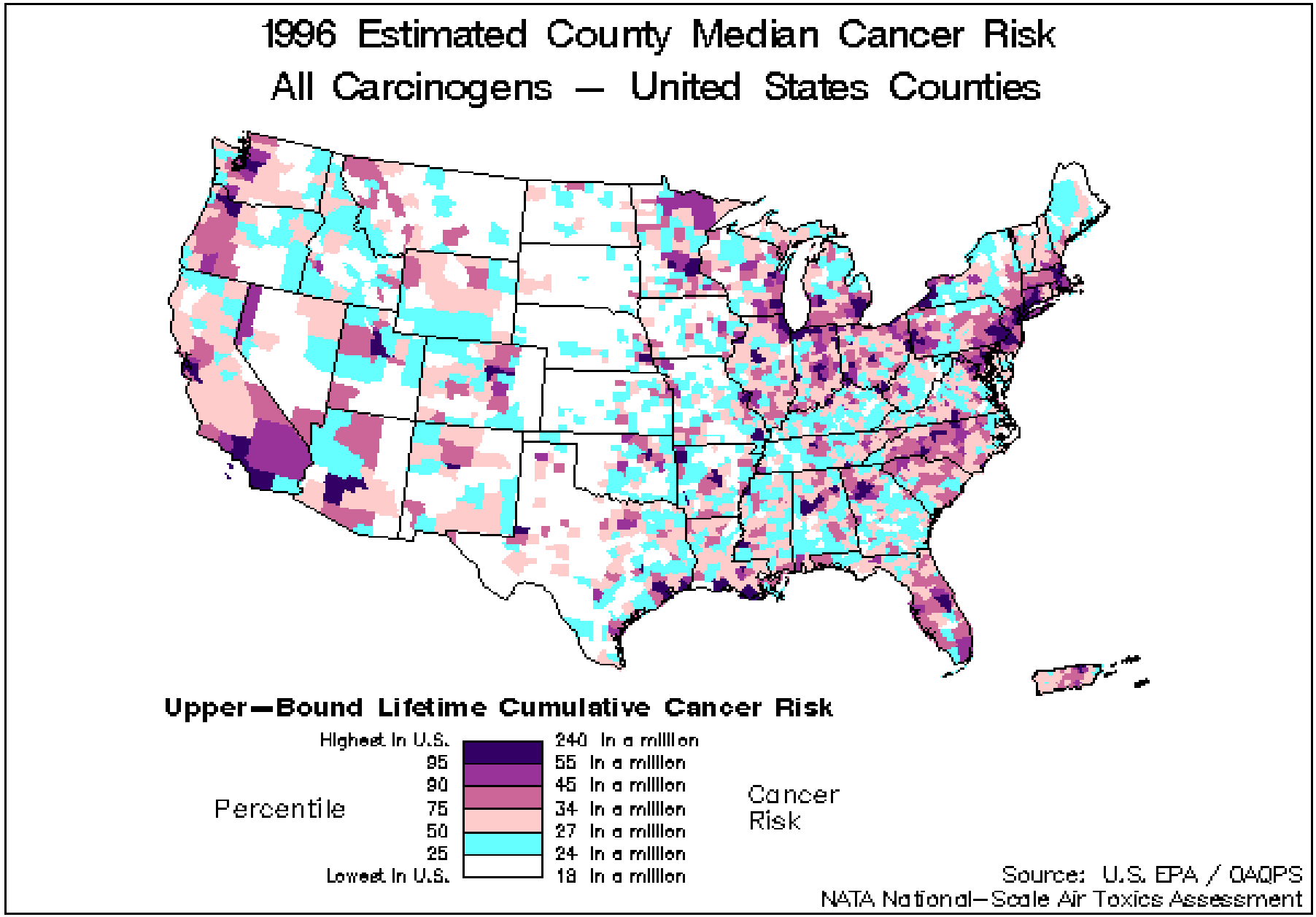
- **Overall Confidence in exposure estimates**

  (considers sources of uncertainty associated with estimates of emissions, ambient concentrations & exposure concentrations)
  - Higher – Green circle
  - Medium – Yellow circle
  - Lower – Orange circle

- **Confidence in Cancer Risk Estimates**
  - Higher
  - Medium
  - Lower

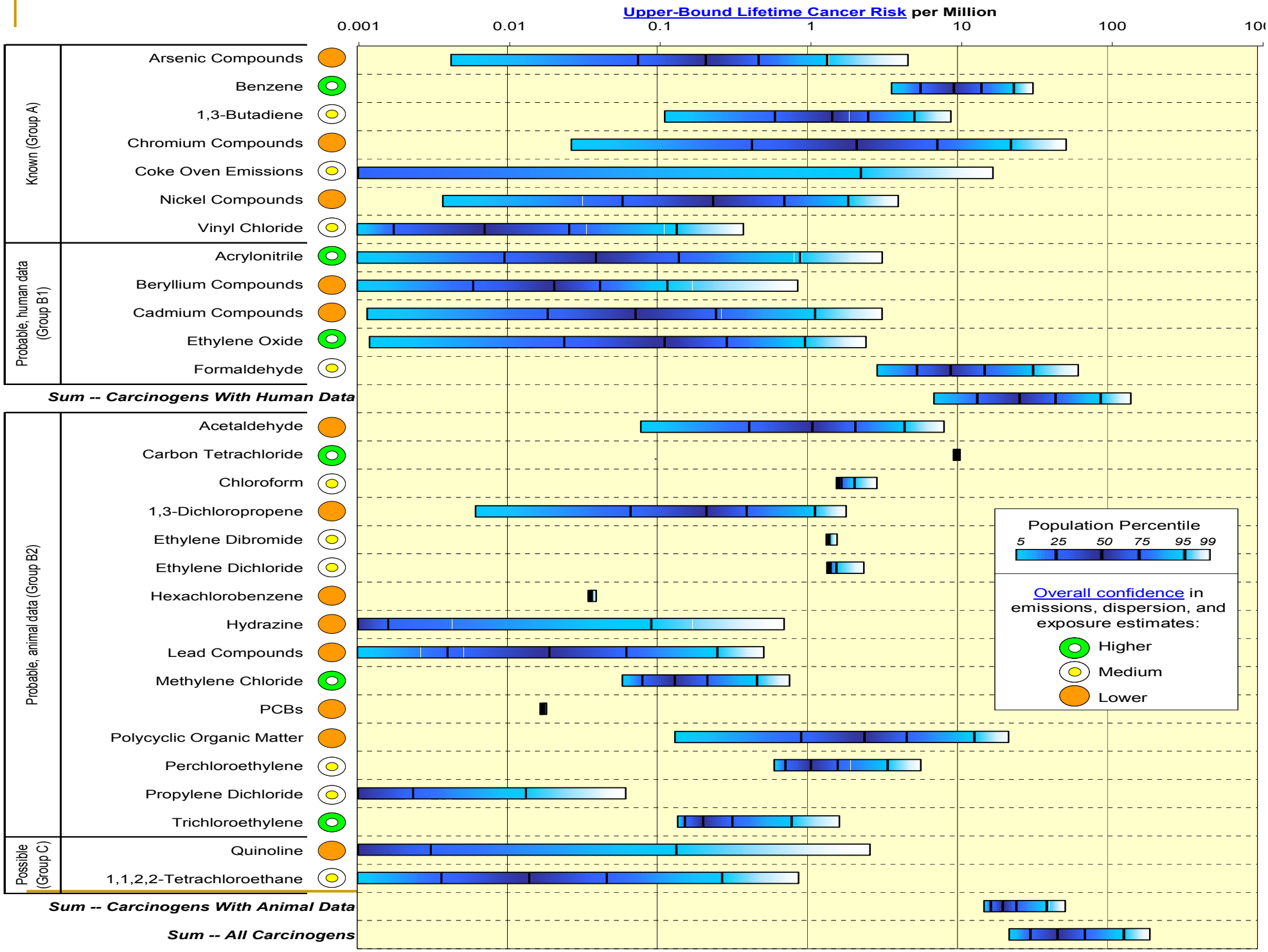
- **Confidence in Noncancer Risk Estimates**
  - Higher -
  - Medium
  - Lower

Example Risk Map



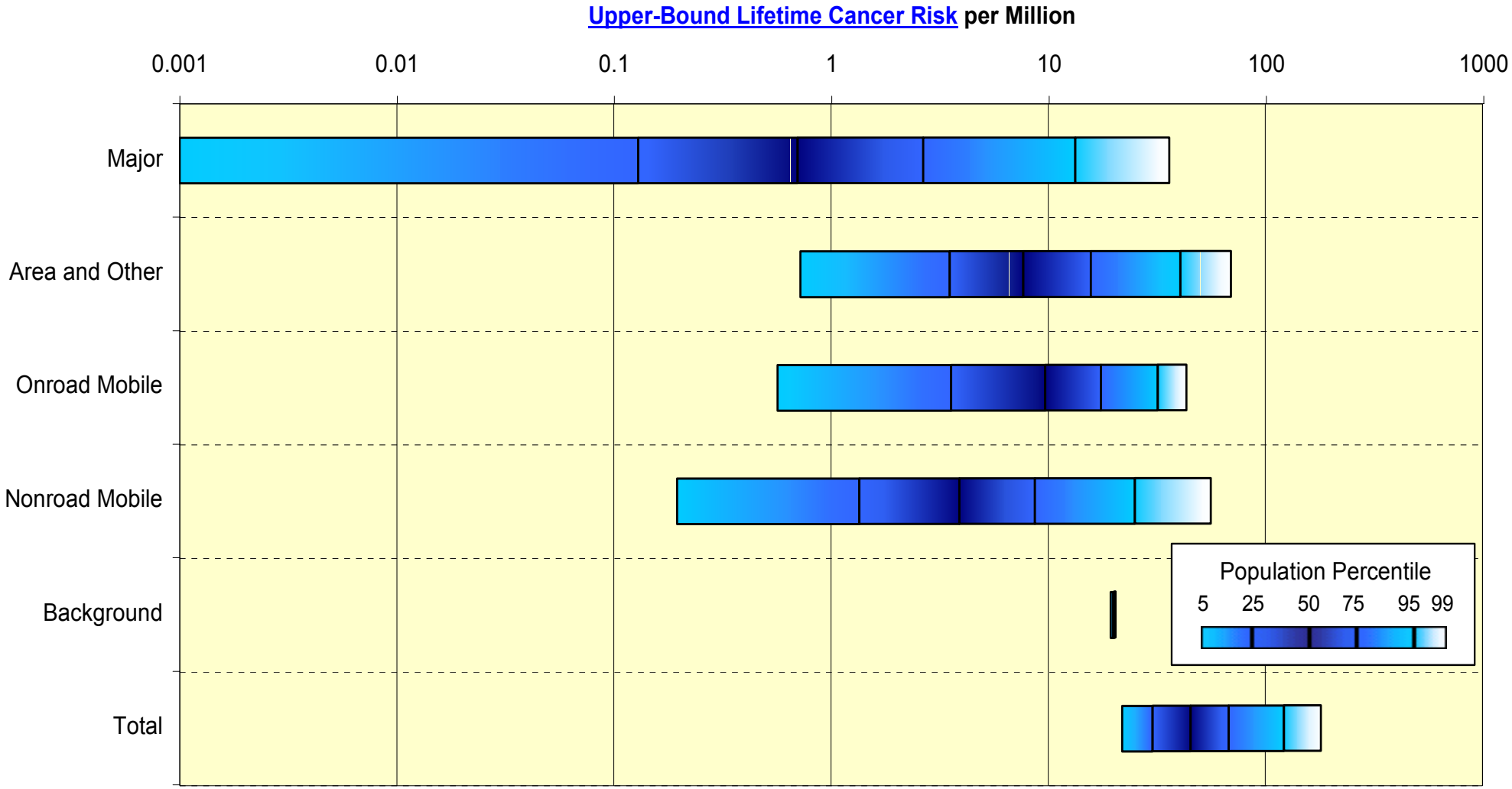
1996 Risk Characterization

Distribution of lifetime cancer risk for the US population, based on 1996 exposure* to all sources combined.



1996 Risk Characterization

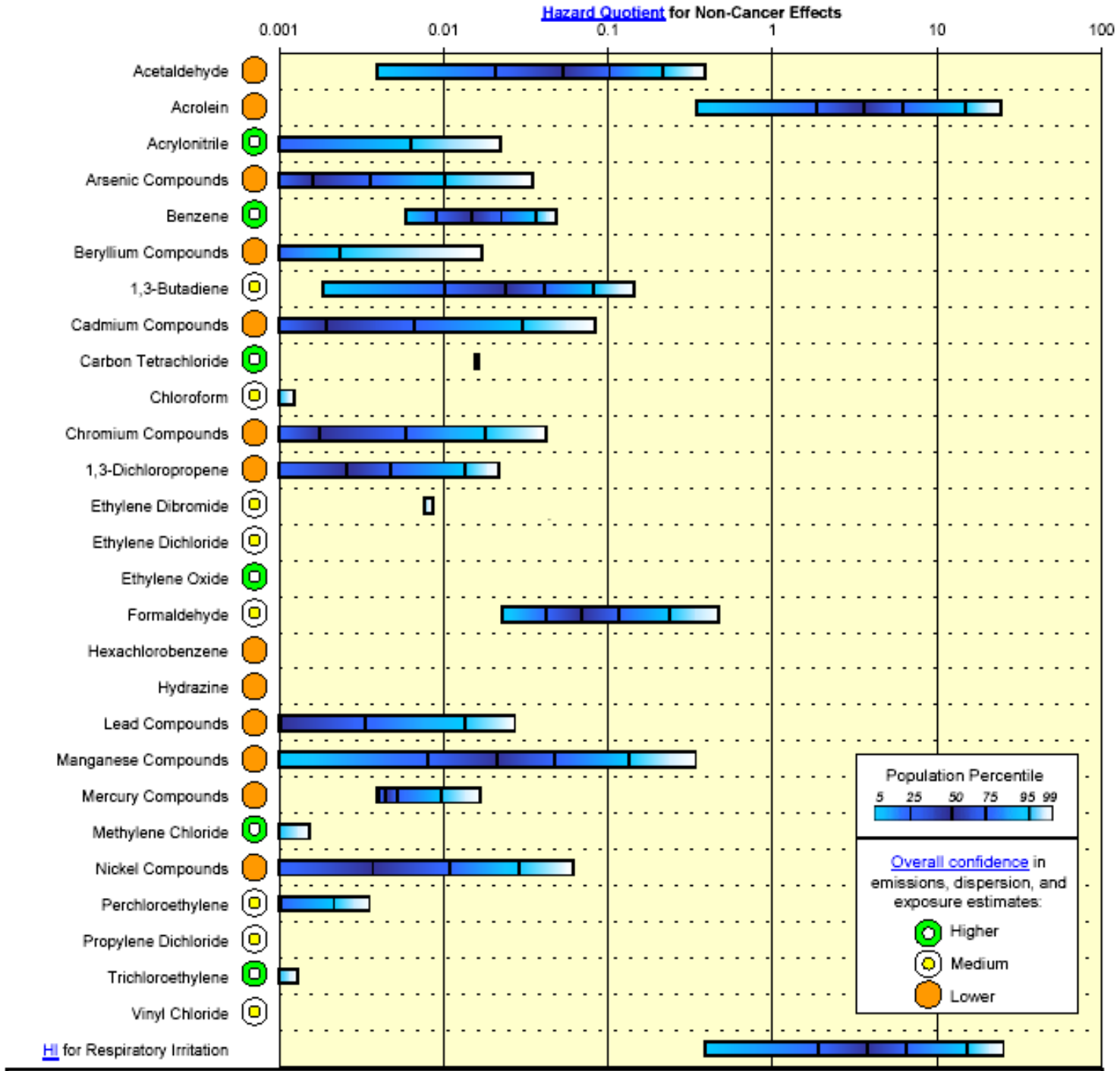
Distribution of lifetime cancer risk for the US population, based on 1996* exposure to 29 carcinogenic air pollutants from various source sectors



** Results are based on inhalation exposure to outdoor sources only. Although these results assume continuous exposure to 1996 levels of air toxics over a lifetime, current and planned control programs are expected to substantially reduce these exposures and associated cancer risk for some pollutants. See additional information on the following page.*

1996 Risk Characterization

Distribution of non-cancer hazard quotient for the US population, based on 1996 exposure* to all sources combined.



Results are based on inhalation exposure to outdoor sources only. Although these results assume continuous exposure to 1996 levels of air toxics over a lifetime, current and planned control programs are expected to substantially reduce these exposures and associated cancer risk for some pollutants. See additional information on the following page.

Initial National-Scale Assessment
Risk Characterization

- Cancer
  - National drivers[1]
    - Benzene
    - Chromium
    - Formaldehyde
  - Regional drivers[2]
    - Arsenic
    - 1,3-Butadiene
    - Coke oven emissions
    - POM
- Non-Cancer
  - National drivers[3]
    - Acrolein
  - Regional drivers[4]
    - Acetaldehyde
    - Arsenic
    - 1,3-Butadiene
    - Formaldehyde
    - Manganese

[1] Risk > 10 in 1 million to 25 million people

[2] Risk > 10 in 1 million to 1 million people OR Risk > 100 in 1 million to 10,000 people

[3] HQ > 1.0 to 25 million people

[4] HQ > 1.0 to 10,000 people

Initial National-Scale Assessment Risk Characterization

- **Not found to be drivers or contributors**
  - Hexachlorobenzene
  - Lead compounds
  - Mercury compounds
  - Methylene chloride
  - PCBs
  - Propylene dichloride
  - Vinyl chloride
- **But this assessment cannot exonerate HAPs because:**
  - It includes inhalation exposure only - some air pollutants (e.g., PCBs, mercury, lead) may pose significant risks by ingestion
  - It has low resolution – may not capture hot spots
  - Limited comparisons show substantial underprediction of ambient levels, especially for metals
  - It does not estimate individual extremes – only typical exposures

The Initial National-Scale Assessment does not answer all questions; it helps us…

- Identify air toxics of greatest concern
- Characterize contributions of different emission sources to exposure and risk
- Prioritize collection of new data
- Provide a baseline (with ambient data) to track trends and measure progress against goals
- By itself, the assessment is **NOT** being used as the basis for specific regulatory decisions